Bonneville Power Administration
Fish and Wildlife Program FY99 Proposal

Section 1. General administrative information

Kootenai River White Sturgeon Studies And Conservation Aquaculture

Bonneville project number, if an ongoing project 8806400

Business name of agency, institution or organization requesting funding
Kootenai Tribe of Idaho

Business acronym (if appropriate) KTOI

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Subcontractors.

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NPPC Program Measure Number(s) which this project addresses.
10.3B.11, 10.4B.1, 10.4B.2, 10.4B.5, 10.8B, 2.2G

NMFS Biological Opinion Number(s) which this project addresses.
Kootenai River White Sturgeon Biological Opinion (59 FR 45989)
ESA Section 10 Permit No. PRT-798744

Other planning document references.
Bonneville Power Administration. 1997. Kootenai River White Sturgeon Conservation Aquaculture Project Environmental Assessment. DOE/EA 1169. Portland, Oregon

Kincaid, H. 1993. Breeding Plan to Preserve the Genetic Variability of the Kootenai River White Sturgeon. Final Report to the Bonneville Power Association. Contract Number DE-AI79-93B002886. Portland, Oregon
.
Resident Fish Manager's Caucus of the Columbia Baisn Fish and Wildlife Authority (RFM-CBFWA). 1997. Multi-Year Implementation Plan for Resident Fish Protection, Enhancement, and Mitigation in the Columbia River Basin. Final Draft, June 3, 1997. Columbia Basin Fish and Wildlife Authority, Portland, Oregon.

U.S. Department of Interior, Fish and Wildlife Service. 1996. White Sturgeon: Kootenai River Population Draft Recovery Plan. Region 1, USFWS, Portland, Oregon.

Subbasin.
Kootenai

Short description.
Prevent extinction, preserve existing gene pool, and begin rebuilding healthy age classes of the endangered white sturgeon in the Kootenai River using conservation aquaculture techniques with wild broodstock.

Section 2. Key words

Mark	Programmatic Categories	Mark	Activities	Mark	Project Types
	Anadromous fish	+	Construction		Watershed
X	Resident fish	+	O & M	+	Biodiversity/genetics
	Wildlife	X	Production	+	Population dynamics
	Oceans/estuaries	+	Research	+	Ecosystems
	Climate	+	Monitoring/eval.	+	Flow/survival
	Other	+	Resource mgmt		Fish disease
			Planning/admin.	X	Supplementation
			Enforcement		Wildlife habitat en-
			Acquisitions		hancement/restoration

Other keywords.

conservation aquaculture, white sturgeon, life history, sampling, fish health, genetics, kokanee

Section 3. Relationships to other Bonneville projects

Project #	Project title/description	Nature of relationship
8806500	Kootenai River Fisheries Investigations	Co-investigator
9404900	Kootenai River Ecosystems Improvements Study	Co-investigator
9401200	Kootenai River White Sturgeon - M&E	Supplemental funding for monitoring and evaluation

Section 4. Objectives, tasks and schedules

Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	Prevent extinction and preserve genetic variability of white sturgeon in the Kootenai River using conservation aquaculture.	a	Collect and spawn wild broodstock following protocol outlined in the breeding plan for white sturgeon in the Kootenai River (Kincaid 1993).
1		b	Rear progeny in at least two separate facilities to prevent fish loss due to unforeseen circumstances. Begin planning process for facility to be constructed for white sturgeon rearing using a reliable water source.
1		c	Retain family identity by keeping families separate during egg, larvae, and juvenile stages.
1		d	Investigate cryopreservation techniques for sperm and ova, as well as viability of sperm collected in the field.
1		e	Further refine disease testing protocol for detection of the

			presence and prevalence of white sturgeon iridovirus (WSIV).
1		f	Release up to 1,000 white sturgeon per family into the Kootenai River following release protocol outlined in the breeding plan (Kincaid 1993).
2	Monitor and evaluate genetic variability, survival, condition, growth, movement, and habitat use of hatchery reared juvenile white sturgeon released into the Kootenai River.	a	Conduct sonic tracking studies to determine movement and habitat use of hatchery reared juvenile white sturgeon.
2		b	Collect juvenile white sturgeon to determine life history characteristics using gillnets, hoopnets, and angling.
2		c	Develop and validate permanent tagging and marking techniques for artificially propagated white sturgeon.
2		d	Evaluate habitat characteristics in areas used by juvenile white sturgeon and identify habitat improvement opportunities.
2		e	Evaluate genetic characteristics of hatchery produced juvenile white sturgeon.
3	Provide facilities, assistance, and coordination for additional research and training.	a	Hatch and rear certified disease-free rainbow trout as food for wild white sturgeon brood stock. and as part of aquaculture training.
3		b	Provide facilities and assistance for development of research methods for IDFG burbot and rainbow trout project.
3		c	Provide facilities and assistance for cooperative research with USGS National Biological Service to determine timing of embryo development of white sturgeon.
3		d	Provide facilities and assistance for cooperative research with IDFG to determine hatching

			success of white sturgeon embryos using filtered and unfiltered river water.
4	Investigate kokanee fishery improvement opportunities.	a	Collect baseline abundance, distribution, and reproduction data for native kokanee in lower Kootenai River tributaries.
4		b	Provide recommendations and implementation program for improving kokanee spawning habitat in Kootenai River tributaries.
4		c	Obtain disease-free kokanee eggs from Canada for experimental reintroductions into tributaries in the lower Kootenai River where kokanee have been extirpated.
5	Assist IDFG with the monitoring and evaluation of natural spawning of white sturgeon.	a	Use artificial substrate mats to sample for eggs and larvae in areas above Bonners Ferry when fish move above the bridge.
5		b	Use D-ring plankton nets to sample for eggs and larvae during spawning.
5		c	Sample stomachs of predator fish for eggs and larvae.

Objective schedules and costs

Objective #	Start Date mm/yyyy	End Date mm/yyyy	Cost %
1	1/1991	1/2015	65.00%
2	3/1992	4/2022	20.00%
3	1/1991	1/2015	5.00%
4	1/1993	1/2005	5.00%
5	1/1991	1/2015	5.00%
			TOTAL 100.00%

Schedule constraints.
The conservation aquaculture program should continue until evidence is available to show that natural reproduction is yielding adequate recruits to sustain the genetic variability of the population, as defined in the recovery plan (USFWS 1996).

Completion date.

Section 5. Budget

FY99 budget by line item

Item	Note	FY99
Personnel	Biologist/Admistrator; Hatchery Manager; 4 Fish Culturists; 2 part time M&E; Hatchery Maintenance	$257,000
Fringe benefits	33% of Personnel Costs	$84,810
Supplies, materials, non-expendable property		$35,000
Operations & maintenance		$120,000
Capital acquisitions or improvements (e.g. land, buildings, major equip.)		$60,000
PIT tags	# of tags: 6,000	$17,400
Travel	includes training	$10,000
Indirect costs	57.6% of total personnel costs	$196,882
Subcontracts	Includes Professional Services and back-up facility O&M	$100,000
Other	Finish Phase 1 facility upgrades; design and permits for new rearing facility	$400,000
TOTAL		$1,281,092

Outyear costs

Outyear costs	FY2000	FY01	FY02	FY03
Total budget	$2,782,000	$1,942,250	$1,000,000	$1,100,000
O&M as % of total	5.00%	10.00%	20.00%	18.00%

Section 6. Abstract

The white sturgeon (*Acipenser transmontanus* Richardson) population in the Kootenai River was listed as endangered by the U.S. Fish and Wildlife Service on September 6, 1994, due to a virtual lack of recruitment during the last two decades. The Kootenai River White Sturgeon Study and Conservation Aquaculture Project was initiated to preserve the genetic variability of the population, begin rebuilding natural age class structure, and prevent extinction while measures are implemented to restore natural recruitment. A breeding plan will be implemented to guide management in the systematic collection and spawning of wild adults before they are lost from the breeding population. The implementation of the breeding plan includes measures to minimize

potential detrimental effects of conventional stocking programs. The objectives of the conservation aquaculture program are to produce 4-9 separate families per year and use preservation stocking criteria to produce 4 to 10 adults per family that survive to breeding age. Monitoring and evaluation using genetic sampling, sonic tracking, gill-netting, and angling will assess genetic variability, survival, growth, movement, and habitat use of juveniles released into the Kootenai River. Success of the project will be determined by: 1) an increase in the number of juvenile sturgeon in the Kootenai River drainage; 2) survival of hatchery fish to sexual maturity; 3) retention of wild sturgeon life history characteristics and genetics in the hatchery reared population; and 4) an understanding of the life history characteristics and factors limiting natural recruitment of sturgeon in the Kootenai River. This project also proposes to provide recommendations and an implementation program for improving kokanee spawning habitat in Kootenai River tributaries, as well as reintroduction of native kokanee into streams where they have been extirpated. Reintroduction will be accomplished using a native stock of kokanee from the North Arm of Kootenay Lake. The goal will be to improve habitat conditions in tributaries to provide for natural spawning, thereby increasing prey items for sturgeon, as well as improved fishing opportunites for kokanee.

Section 7. Project description

a. Technical and/or scientific background.

The white sturgeon (*Acipenser transmontanus* Richardson) population in the Kootenai River was listed as endangered on September 6, 1994 (59 FR 45989) under the authority of the Endangered Species Act of 1973. The Kootenai River population is one of several land-locked populations of white sturgeon found in the Pacific Northwest. Their distribution extends from Kootenai Falls, Montana, located 50 river kilometers below Libby Dam, downstream through Kootenay Lake to Corra Linn Dam on the lower west arm of Kootenay Lake, B.C. A natural barrier at Bonnington Falls downstream of Kootenay Lake has isolated the white sturgeon in the Kootenai River from other white sturgeon in the Columbia River since the last glacial age approximately 10,000 years ago (Northcote 1973). The population was listed due to the virtual absence of recruitment during the past two decades, declining population size, and post-development habitat loss and degradation. The last substantial year-class was produced naturally in 1974, the year prior to operation of Libby Dam. The dam impounds the Kootenai River near Libby, Montana, forming Lake Koocanusa. Construction and operation of Libby Dam has drastically altered the hydrograph, thermograph, and downstream nutrient loading rates in the Kootenai River. Research since 1991 has confirmed natural spawning in five of the past six years, however natural recruitment has been virtually absent since 1974. In 1995, estimates put the population of adult white sturgeon in the Kootenai River at 1,469 individuals (Paragamian et al. 1996). Nine years of sampling found only 16 naturally recruited white sturgeon (or about 1% of the population) that were 21 years of age or less (Paragamian et al. 1995). Because white sturgeon do not begin reproducing until approximately age 20, this means that the equivalent of one full generation in the white sturgeon life cycle may be lost.

Recovery of the white sturgeon in the Kootenai River is contingent upon re-establishing natural recruitment, minimizing additional loss of genetic variability to the population, and sucessfully mitigating biological and physical habitat changes caused by the construction and operation of Libby Dam. The overall recovery strategy for the white sturgeon in the Kootenai River takes a three-pronged approach (USFWS 1996). Each of the following measures are considered Priority 1 actions to be implemented immediately: 1) augment flows of the Kootenai River to enhance natural reproduction; 2) implement a conservation aquaculture program, i.e., artificial propagation and release, to prevent extinction; and 3) re-establish suitable habitat conditions, to increase the chances of white sturgeon survival past the egg/larval stage. This project directly addresses the Priority 1 action in the recovery plan for white sturgeon. The conservation aquaculture program is currently the only known means to conserve genetic variability of the white sturgeon population, begin rebuilding healthy age class structure, and prevent extinction while other measures are taken to re-establish suitable habitat conditions to increase the liklihood of adequate recruitment in the wild white sturgeon population.

The recovery plan for white sturgeon takes an ecosystem approach by including measures to benefit other resident fish species. Native kokanee are considered an important prey item for white sturgeon and also provided an important fishery in the tributaries of the lower Kootenai River. Native kokanee populations have declined dramatically in the past two decades. Kokanee runs into north Idaho tributaries of the Kootenai River numbering thousands of fish as recently as the early 1980's (Partridge 1983) have now become "functionally extinct". Redd counts from 1993-1997 indicate the South Arm stock of kokanee from Kootenay Lake that migrates into the tributaries of north Idaho has been extirpated (Anders 1995; Ireland 1997). This project plans to implement habitat protection and restoration measures on degraded streams by identifying areas where streams can be restored, working with private landowners to restore and protect stream habitat, and reintroduce native kokanee from the North Arm of Kootenay Lake using instream incubation techniques, as well experimental imprinting of kokanee hatched in the aquaculture facility.

This project also meets the following goals and objectives outlined in the Council's Fish and Wildlife Program (FWP 1994) and the Resident Fish Section of the Multi-Year Implementation Plan (RFM-MYIP 1997). The overall goal of the FWP and the RFM-MYIP is to promote the long term viability of native fish in native habitats where possible. The decline of native fish species in the Kootenai River drainage has been attributed to the construction and operation of Libby Dam (USFWS 1996). The following objectives have been listed in the RFM-MYIP for white sturgeon and kokanee in the Kootenai River drainage: 1) Mitigate and compensate for the decline of white sturgeon in the Kootenai River drainage caused by the construction and operation of Libby Dam; 2) Preserve existing gene pool and re-establish natural age class structure of the population; 3) Restore recruitment produced by naturally-spawning adult sturgeon; 4) Restore this stock of sturgeon to a sufficient abundance and age distribution to allow for ceremonial, subsistence, and recreational harvest by tribal members and recreational

harvest by sport anglers; and 5) Recover to sustainable harvest levels, the migratory kokanee populations that historically spawned in the westside tributaries to the Kootenai River. The conservation aquaculture program directly addresses these goals as a component in the overall framework of the Council's Fish and Wildlife Program and the RFM-MYIP to promote the long term viability of native fish in native habitats where possible.

The Council's Fish and Wildlife Program lists the following measures that this project addresses:

- 10.3B.11: "In consultation with the Confederated Salish and Kootenai Tribes, the Montana Department of Fish, Wildlife, and Parks, the Kootenai Tribe of Idaho and other appropriate entities, fund the design, operation, and maintenance of mitigation projects in the Kootenai River system and Lake Koocanusa to supplement natural propagation of fish…"
- 10.4B.1: "Operate and maintain a low-capital sturgeon hatchery on the Kootenai Indian Reservation. With Bonneville, explore alternate way to make effective use of the hatchery facility year-round."
- 10.4B.2: "Survey the Kootenai River downstream from Bonners Ferry, Idaho, to the Canadian border to: 1) evaluate the effectiveness of the hatchery, and 2) assess the impact of water-level fluctuations caused by Libby Dam on hatchery operations for outplanting of sturgeon in the Idaho portion of the Kootenai River."
- 10.4B.5: "As part of the Kootenai sturgeon recovery strategy the Kootenai Tribe of Idaho is to: 1) operate the Kootenai Tribal sturgeon hatchery and develop propagation methods to ensure healthy sturgeon are outplanted into the Kootenai River, 2) participate on the water budget team, and 3) conduct monitoring and evaluation to assess the effectiveness of these measures…"
- 10.8B: Biological objectives for kokanee salmon in the Kootenai River
- 2.2G.1: "The Council calls for the development, funding, and implementation of agreements between fish and wildlife managers on both sides of the U.S./Canada border that recognize the mutual benefit of protection mitigation and enhancement for transboundary species…"

The program has integrated the measures called for in the FWP and provided promising progress toward the recovery of white sturgeon in the Kootenai River drainage.

b. Proposal objectives.

1. Prevent extinction and preserve genetic variability of white sturgeon in the Kootenai River using conservation aquaculture.

The captive breeding program will use 3-9 females and an equal number of males captured from the Kootenai River each spring. Fish will be spawned in pairs or in diallel mating designs to produce individual families that will be reared separately to maintain family identity. Fish will be marked to identify family and year class before release.

Number of fish released will be equalized at up to 1,000 per family. Assuming annual survival rates of 50% for years 2 and 3, and 85% for years 4-20 of all fish planted, the target numbers would yield approximately 8 progeny per family or about 4 breeding pairs per family at age 20. The goal is to produce 4-10 breeding adults per family. Natural survival in the river environment during the 18+ years from planting to maturity would result in variability in genetic contribution of families to the next broodstock generation. Number of fish released per family will be adjusted in future years when actual survival rate is known. Implementation of the breeding plan each year for the 20-year generation interval using 5 different mating pairs per year would yield an effective population size of 200. Because this program is designed to produce approximately 8 breeding adults per family and to approximate a "normal expanding" natural population, it should not exaggerate the contribution of a small fraction of the parent population, as occurs in typical supplementation programs.

2. Monitor and evaluate genetic variability, survival, condition, growth, movement, and habitat use of hatchery reared juvenile white sturgeon released into the Kootenai River.

Monitoring and evaluation is an important component of the overall program and results will be used in an adaptive management approach. Specific tasks are outlined in Section 4 of this document.

3. Provide facilities, assistance, and coordination for additional research and training.

Numerous cooperative arrangements have been made to use the aquaculture facility for important research occuring within the Kootenai drainage, as well as throughout the Columbia Basin. The projects are described in Section 4.

4. Investigate kokanee fishery improvement opportunities.

KTOI has been collecting baseline abundance, distribution, and reproduction data for native kokanee in six lower tributaries of the Kootenai River for the past five years using redd counts and visual observation. Habitat data (number of habitat units and amount of available spawning habitat) has been collected on 3 streams to date. KTOI will complete habitat surveys this year and evaluate each stream for habitat restoration opportunites. All lower portions of the tributaries are on private land and KTOI has already built a relationships with the landowners. Some have expressed interest in a partners program to restore riparian areas and degraded stream banks. Reintroduction of kokanee into the west side tributaries will only occur if concurrent habitat work can take place. Disease-free kokanee eggs (eyed) from the North Arm stock of Kootenay Lake in British Columbia will be used for reintroduction. Reintroduction techniques will include instream incubation as well as experimental imprinting of kokanee hatched at the Kootenai Tribal. Hatching success of eggs incubated instream will be determined using emergence traps. Success of imprinting will be determined by marking smolts and monitoring returns to the stream.

5. Assist IDFG with the monitoring and evaluation of natural spawning of white sturgeon.

The evaluation of natural spawning of white sturgeon is an IDFG objective. KTOI will not duplicate that effort but rather augment sampling by using different gear types, sampling in areas not previously sampled, and sharing information.

c. Rationale and significance to Regional Programs.

The project is part of the overall recovery plan for the white sturgeon in the Kootenai River. Several other related projects in the drainage address other important aspects of recovery. IDFG Project 8806500 assesses the natural spawning of the white sturgeon, MFWP Project 8346500 develops and refines experimental flow releases for sturgeon, and KTOI Project 9404900 identifies opportunites for ecosystem recovery. Together the projects further the overall goal of the FWP to protect native fish in their native habitats. A cooperative relationship exists between these projects and resources are frequently shared. The rationale for using conservation aquaculture is clearly outlined in the breeding plan to preserve genetic variability of the endangered white sturgeon in the Kootenai River (Kincaid 1993), as well as the recovery plan (USFWS 1996). Taking no action risks extinction of the species in the Kootenai River.

d. Project history

The Kootenai River white sturgeon study and conservation aquaculture program began in 1991 in response to questions concerning water quality, white sturgeon gamete viability and the feasibility of aquaculture as a component to population recovery. In 1991, 1992, 1993, and 1995 progeny from wild broodstock were successfully produced and reared in the Kootenai Tribal Hatchery. The white sturgeon was listed as endangered in 1994 and no broodstock capture or spawning occurred. Two experimental releases of a total of 305 fish occurred in 1992 and 1994 (representing 1990, 1991, and 1992 year classes). During 1995, 25 hatchery reared white sturgeon were captured using gill-nets (Paragamian et al. 1995). During 1996, 45 hatchery reared juveniles were captured in the Kootenai River (Paragamian et al. 1996). This information indicates that sturgeon released as age 1+ are surviving in the Kootenai River. In April and October 1997, 2200 white sturgeon juveniles representing 4 family groups from the 1995 year class were released Ireland 1997). We are in the process of monitoring the releases using sonic tracking and gill-netting. Results will be summarized in the annual progress report. Target release numbers for the preservation stocking program will be adjusted as more information on survival of hatchery reared juveniles becomes available.

The program has accomplished many goals with a low yearly average expenditure ($361,433/year since 1990 including cost of aquaculture facility). In 1996, due to high spring runoff, cold water temperatures, and take limitations on timing of broodstock collection, no sturgeon from the 1996 year class were produced. Through coordination

with USFWS and IDFG, we now have the capability of collecting broodstock at more appropriate times and locations. In 1997, the entire year class was lost as a result of an unfortunate chain of events: 1) In 1996, a proposal was presented to CBFWA to perform some of the necessary upgrades needed at the hatchery. The funding request was not approved; 2) In January 1997, KTOI presented another request for funding in order to upgrade the facility and provide funding for a back-up facility operated by IDFG in Sandpoint. The RFM approved partial funding of the request. The facility in Sandpoint was to be used for back-up but was not available because a broken main waterline had not been repaired. Because the facility was not operational, the KTOI did not have a portion of the 1997 year class in a fail-safe facility; and 3) The use of water from the Northside Water District (de-chlorinated through a charcoal filter) to incubate and rear white sturgeon to 3 weeks of age has been the only successful way to produce sturgeon in the past. Incubating in river water has caused fungus problems and egg suffocation because of silt and bacteria present in the flow-through river water system. This year, the North Side Water District replaced some main lines in the water system and flushed them with chlorine during our most critical stage at the hatchery. The amount of chlorine was more than the filter could handle, resulting in the overnight loss of the entire 1997 year class.

With increased expectations to fully implement the program and the difficulties encountered concerning the loss of the 1996 and 1997 year classes, the conservation aquaculture facility needs to be brought up to standard (may be accomplished in FY98) to deal with problems concerning equipment reliability, and water quality and quantity. There is also a need to provide adequate rearing space for up to 9 families per year. Each family group must be reared separate from other family groups to ensure proper identification at outplanting and also must be reared at low densities to prevent disease outbreak (LaPatra et al. 1994). For this reason, we are proposing to begin the planning process for a new facility within the Kootenai River drainage to provide adequate rearing space and a separate, reliable water source. This is futher summarized in Section 7f.

The Tribe, as directed by USFWS and in accordance with Council Measure 2.2G.1, has forged a relationship with Canada concerning the recovery of sturgeon. Canada will be providing a “fail-safe” facility for the Kootenai River white sturgeon at the Kootenay Trout Hatchery (KTH) for a relatively low cost beginning in 1998. A portion each year class of white sturgeon hatched at the Kootenai Tribal Hatchery will be transported to the Kootenay Trout Hatchery in Fort Steele, B.C. to ensure no catastrophic losses of future year classes. Several advantages to using the KTH for a fail-safe as opposed to other locations include: 1) cost effectiveness - the hatchery is already operating and staffed to produce other fish species; 2) located within the Kootenai drainage; 3) fish culture expertise on-site; 4) proven source of high quality groundwater; 5) 24 hour standby system already in place for emergency response; 5) educational opportunity for sturgeon conservation displays in visitor area – 10,000 visitors annually; and 6) close proximity to Bonners Ferry to allow collaboration with KTOI staff.

e. Methods.

Sturgeon culture techniques differ from those used for salmonids because of inherent differences in gonal development, spawning frequency, and sperm and egg structure, physiology, and biochemistry. Given the uniqueness of the species and the new concept of conservation aquaculture for a long-lived species, methodology has been adapted by networking with experts in the field, as well as using and refining techniques described in the Hatchery Manual for White Sturgeon (Conte et al. 1988). Techniques have been refined to suit the purposes of the conservation aquaculture program. For example, surgical removal of eggs was used for 2 years until hand-stripping of eggs proved to be a viable alternative. Hand-stripping of eggs greatly minimizes stress associated with Cesarean surgery and reduces the recovery period of post-spawning adult white sturgeon prior to release back into the wild. Also, we are in the process of refining techniques for field collection and storing of sperm to minimize the number of wild fish brought to the hatchery.

From March though June, wild white sturgeon from the Kootenai River are collected using setlines and angling. Captured fish are placed ventral side up in a hooded stretcher suspended across the gunwales. Sex and reproductive development is determined by visual observation of gonadal tissues through a 2-3 cm midline incision on the ventral surface of the fish. Reproductive development of males and females is categorized according to criteria reported by Conte et al. (1988). All fish are examined for recapture, the removal of a scute, marked with a PIT tag, weighed, and measured. Once sex and reproductive status is determined, fish are either brought to the hatchery for spawning in an oxygenated tank truck or released back into the river.

A complete description of broodstock evaluation, gamete processing, and incubation of eggs is outlined in Conte et al. (1988). This includes information concerning: 1) assay to determine spawnable females and final oocyte maturation; 2) spawning induction of females including injection schedule for LHRHa, injection procedures, and observation of response; 3) milt and egg extraction overview including checking sperm viability, sperm dilution, egg fertilization, and egg de-adhesion; and 4) incubation of eggs and early life stages.

Sturgeon are reared in the Kootenai Tribal Hatchery for up to 2 years prior to release. One month before release, the fish are disease tested using the protocol developed by USFWS and Clear Springs Research and agreed upon by all agencies. Test results are provided to all agenicies and a transportation and release permit is obtained from IDFG at the request of KTOI and USFWS. Release numbers are determined each year by the white sturgeon recovery team. Before release, each fish is weighed, measured, tagged with a PIT tag, and has a scute removed to identify year class in case of tag loss. Sturgeon are transported to the release site in an oxygenated tank truck and released from shore or by boat. Small 45 day sonic transmitters are attached to several juvenile white sturgeon to evaluate movement after release.

Monitoring and evaluation of juvenile white sturgeon is accomplished using sonic tracking, gill-netting, hoopnets, and angling. Habitat use will be characterized by identifying areas where juvenile sturgeon are located by telemetry or captured and measuring physical habitat attributes (depth, temperature, water velocity, pH, conductivity, TDS, etc.) and describing specific habitat type. Genetic characteristics of juvenile white sturgeon will be archived by placing a tissue sample from the pectoral fin in a lysis buffer tube and sending to the lab. At least 5% of each family group will be individually sampled. The goal of the release is to provide 4-10 spawners per family at age 20. Considering the long time to maturation, monitoring and evaluation of the hatchery releases will need to be a long term commitment.

Monitoring and evaluation of natural spawning of white sturgeon will be accomplished using artificial substrate mats (McCabe and Beckman 1990), D-ring plankton nets (Parsley et al. 1989), and stomach sampling of predator fish.

Kokanee spawning ground surveys were conducted in 1993 to 1997 in lower Kootenai River tributaries. Spawning kokanee, redds, and spawned out carcasses were counted and stream temperature was recorded. Streams were surveyed twice a week between the end of August and the first week of September. Habitat surveys were performed on 3 tributaries to quantify type, number, and length of habitat units and available spawning gravel. Reintroduction techniques will include instream incubation as well as experimental imprinting of kokanee hatched at the Kootenai Tribal Hatchery. Hatching success of eggs incubated instream will be determined using emergence traps. Success of imprinting will be determined by marking smolts and monitoring returns to the stream. Biological objectives for kokanee returns are listed in the FWP (1994). A proposal including details of all methodology will be developed for the reintroduction program.

f. Facilities and equipment.

In response to the Council's 1987 Columbia River Basin Fish and Wildlife Program, BPA funded the construction of the KTOI Experimental White Sturgeon Facility, which began operations in the spring of 1991. The low-capital facility was originally constructed to determine whether artificial propagation was feasible based on existing water quality of the Kootenai River and whether gametes from wild sturgeon in the Kootenai River were viable. Initial culture efforts have successfully fertilized and incubated eggs in 1991, 1992, 1993, and 1995. The facility was considered experimental until 1996, when the draft recovery plan called for the full implementation of the conservation aquaculture program (USFWS 1996). The existing facility and equipment is inadequate to meet the new expectations of the conservation aquaculture program as stated in the recovery plan (USFWS 1996) and the breeding plan to preserve genetic variability of the white sturgeon in the Kootenai River (Kincaid 1993). A 1997 funding request has been presented to NPPC and CBFWA for approval to bring the facility up to standard in order to provide adequate reliability (Phase I System Improvements). The funding request should be approved in time to make the following improvements to the existing facility by the 1997

spawning season: 1) Upgrade the water supply capacity; 2) Improve the water treatment system to assure acceptable water quality; 3) Improve reliability through equipment upgrades and redundancy; and 4) Improve facilities for maintenance and protection of equipment. The existing hatchery and rearing operations will still experience significant obstacles related to temperature fluctuations in the river, potential for catastrophic contamination of the river upstream, and inadequate rearing space. Phase II improvements will be included in the FY99, FY2000, and FY2001 funding requests for this project. Phase II will address the ability to moderate river water supply temperatures and/or quality with a local groundwater resource at the existing facility, as well as develop an alternative rearing facility. The alternative facility would mitigate river water quality and temperature concerns by providing a separate location with a more reliable water source for hatching and rearing the fish. It would also expand rearing capability for the increased family numbers called for in the breeding plan (Kincaid 1993). The existing facility would become the river water rearing operation and "fail-safe" facility for the alternative site. All equipment and facilities will be designed for possible future conversion to other native species once white sturgeon recovery is assured.

Other facilities include an outbuilding with 6 - 20' rearing tanks, an office building, and small storage shed. We will be building other support facilities in FY98, including a boat shed and crew quarters. Vehicles, boats, and office equipment are adequate for the current program needs. Minor supplies and equipment are included in the project budget.

g. References.

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Partridge, F. 1983. Kootenai River Fisheries Investigations. Idaho Department of fish and Game. Job Completion Report. Project F-73-R-5, Subproject IV, Study VI, Boise, Idaho.

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U.S. Department of Interior, Fish and Wildlife Service. 1996. White Sturgeon: Kootenai River Population Draft Recovery Plan. Region 1, USFWS, Portland, Oregon.

Section 8. Relationships to other projects

All recovery work is coordinated through the white sturgeon recovery team that includes members from the U.S. Fish and Wildlife Service (USFWS), Kootenai Tribe of Idaho (KTOI), Idaho Department of Fish and Game (IDFG), Montana Fish, Wildlife, and Parks (MFWP), University of Idaho (U of I), Army Corp of Engineers (ACOE), British Columbia Ministry of Environment, Land, and Parks (BC MELP), and Canada Department of Fisheries and Oceans (CDFO). The white sturgeon in the Kootenai

drainage are a transboundary fish, crossing interstate and international boundaries. This project is a component of many different programs working concurrently on the recovery of the white sturgeon and the ecosystem it inhabits. See Section 3 for some of the detailed relationships of these projects. Other relationships are summarized below.

All field data collected on white sturgeon is compiled in a single database coordinated by IDFG. Data is compiled to provide the most accurate and up to date information concerning broodstock collection, capture of wild sturgeon for sonic tracking, and locations of fish fitted with transmitters, etc. MFWP is compiling IFIM information for the lower Kootenai River that will be useful in determined habitat availability for white sturgeon and other native species in the drainage

The genetic analysis of archived samples at University of Idaho will require collaboration with the Institute of Aquaculture and may contribute to research proposed this year by Dr. Matt Powell concerning genetic diversity of white sturgeon stocks in the Columbia Basin. We have also provided genetic samples to the USFWS forensics lab in Ashland, Oregon to assist in stock identification in the illegal trade of caviar. BC MELP also requested tissue samples for stock identification in the Columbia Basin in Canada.

Kathy Clemens and John Morrison (USFWS), Scott LaPatra (Clear Springs Research in Buhl, ID), Dr. Joseph Groff (UC Davis), and Sally Goldes (BC MELP) have all been instrumental in designing a disease testing protocol for the release of hatchery reared white sturgeon, as well as designing research to better understand white sturgeon iridovirus (WSIV).

In 1997, we provided facilities and assistance to the USGS Biological Service for a research project to determine the timing of white sturgeon embryo development. This project required intense sampling during the incubation stage. This research will be repeated in 1998 using different water temperatures. Also in 1998, we will be providing facilities and support to a graduate student investigating the effects of heavy metals on incubation and hatching.

In 1994, the KTOI went to Canada to teach BC MELP field techniques for sex detemination of adult white sturgeon. In 1997, BC MELP provided the KTOI with 100,000 kokanee eggs from the North Arm stock of Kootenay Lake. BC MELP transported the eggs to the border and then accompanied KTOI to Long Canyon Creek, a tributary to the Kootenai River in Idaho, to demonstrate instream incubation techniques. BC MELP will also be providing a back-up facility for juvenile white sturgeon from the Kootenai Tribal Hatchery.

NRCS frequently contacts KTOI concerning the wetlands reserve program, stream rehabilitation, and conservation easements in the Kootenai drainage. We have discussed joint proposals and partnerships for conservation efforts in the Kootenai River drainage.

Upper Columbia United Tribes (UCUT) provides a small portion of funding each year to be used in fisheries research by the KTOI. The UCUT organization also provides technical support for certain aspects of the fisheres program.

All work has been accomplished through the necessary permitting process. A Section 10 Permit has been issued to KTOI for Incidental Take. NEPA requirements have been met for white sturgeon releases. IDFG fish transportation permits have been issued for all fish transport and release. Disease testing protocol has been developed and carried out to the satisfaction of all agencies and entities involved. Because the Kootenai River drainage lies within Montana, Idaho, and British Columbia, any action has the potential to affect the fishery in another area. For that reason, coordination among all agencies is important to the recovery of the Kootenai River ecosystem.

Section 9. Key personnel

Susan C. Ireland Fisheries Biologist/Adminstrator 1 FTE Kootenai Tribe of Idaho Hired 9/96
B.S. Biology May 1982. University of Idaho.
M.S. Fish and Wildlife Management November 1993. Montana State University.

Position Description: Serve as the Tribal Fisheries Program Manager responsible for all aspects of the program including research and aquaculture.
Primary Duties: 1) Design, implement, and coordinate all aspects of the Fisheries Program; 2) Conduct, supervise, and participate in all aspects of the fisheries research and aquaculture activities; 3) Generate and submit all monthly and annual reports and budgets; 4) Serve as professional spokesperson for the Kootenai Tribe concerning fisheries issues in state, federal, local, and public arenas; 5) Serve as negotiator and liason among regional, national, and Canadian fisheries agencies concerning all political and biological interagency agreements; 6) Keep Tribal Council informed on progress and status of all pertinent fisheries issues and program activities; 7) Assure adherence to Tribal procedures and guidelines by all Fisheries Program personnel.

Previous employment includes:

Fisheries Biologist MSU Fisheries Coop Unit Bozeman, MT 3 years
Fisheries Technician University of Idaho and Montana Fish, Wildlife, and Parks 2 years
Graduate Student Montana State University 2 years
Land Management Committee Chairman MT AFS 1.5 years

Experience has included many aspects of fisheries and habitat sampling, data collection and analysis, and interpreting and reporting results. Native species have been my main career focus including work with white sturgeon in the Snake River and the Kootenai River, pallid sturgeon and shovelnose sturgeon in the upper Missouri River, and

westslope cutthroat in tributaries throughout western Montana. I have also participated other aspects of fisheries management including collection and organization of fisheries data for Montana River Information Systems, contacting fisheries biologists thoughout the state to contribute to the database, reviewing and commenting on environmental assessments relating to fisheries habitat, and serving in volunteer positions in the Montana Chapter of AFS.

Ireland, S.C. 1997. Kootenai River White Sturgeon Studies and Conservation Aquaculture. Annual Report (in prep). BPA Project No. 88-64. Portland, Oregon.

Ireland, S.C. 1993. Habitat Use and Seasonal Movement of Westslope Cutthroat Trout on a Basin-Wide Scale. Masters Thesis. Montana State University. Bozeman, Montana

Siple, J.T. and S.C. Ireland. 1996. Kootenai River White Sturgeon Studies. Annual Hatchery Report. BPA Project No. 88-64.

John T. Siple Hatchery Manager 1 FTE Kootenai Tribe of Idaho
University of Idaho 1 year Aquaculture

Position Description: Serve as Tribal Hatchery Manager responsible for all aspects of the aquaculture component of the Fisheries Program.
Position Duties: 1) Supervise, oversee, and provide instructions for all aquaculture operations at the Kootenai Tribal hatchery including: collection of wild broodstock, evaluation of potential spawners and stage of development, assay to determine spawnable females and final oocyte maturation, induction of spawning of females, injection schedule for LHRHa, observation of response, milt and egg extraction, checking sperm viability, sperm dilution, egg fertilization, egg de-adhesion, incubation of eggs, early life stages, feed initiation, disease monitoring, and rearing to release; 2) document all conditions during various life phases; 3) update hatchery operations manual; 4) Supervise 3 full-time and one temporary fish culture technician; 5) provide and implement recommendations for improving efficiency and success at the hatcher; 6) other duties as assigned by the Tribal Fisheries Biologist.

Experience includes:

10 years field and hatchery work with Kootenai and Snake River white sturgeon.
30 total years of fish culture experience with Idaho Fish and Game and Kootenai Tribe of Idaho including spawning, rearing, and stocking of cutthroat trout, rainbow trout, steelhead, and kokanee.

I have worked for Idaho Fish and Game, mainly in fish culture, in various locations throughout the state for 29 years. I now work for the Kootenai Tribe of Idaho and have

been involved in the conservation aquaculture program for the white sturgeon at the Kootenai Tribal Hatchery since it began in 1991. I correspond with many other sturgeon culturists and disease specialists around the country to keep up with the latest developments in sturgeon culture.

Fisheries Publications- White Sturgeon

Siple, J.T. and S.C. Ireland. 1996. Kootenai River White Sturgeon Studies. Annual Hatchery Report. BPA Project No. 88-64

Siple, J.T. and P.J Anders. 1995. Annual Kootenai Hatchery Report. In: Kootenai River White Sturgeon Studies. Annual Report B. BPA Project No. 88-64.

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Siple, J.T. and G. Aitken. 1992. Annual Kootenai Hatchery Report. In: Kootenai River White Sturgeon Studies. Annual Report. BPA Project No. 88-65.

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Siple, J.T. and T.L. Patterson. 1991. Snake River Sturgeon Report. Information from 1988-1990. Progress Report. Idaho Department of Fish and Game. Boise, Idaho.

LaPatra, S.E., J.M. Groff, T.L. Patterson, W.D. Shewmaker, M. Casten, J. Siple, and A.K. Hauck. 1996. Preliminary Evidence of Sturgeon Density and Other Stressors on Manifestation of White Sturgeon Iridovirus Disease. Journal of Applied Aquaculture. Vol. 6, No. 3 pp. 51-58

Section 10. Information/technology transfer

The conservation aquaculture program is an integral part of the USFWS draft recovery plan. As new knowledge is gained, it will be incorporated into the final plan. Information will also be used to guide future efforts of recovery of the white sturgeon and the Kootenai River ecosystem in an adaptive management approach. Information is presented at the annual BPA Review of Projects, regional and national sturgeon symposiums, local conservation and sportsmen groups, as well as other appropriate forums as the opportunity arises. Future publications include a collaboration with Clear Springs Research concerning new knowledge about white sturgeon iridovirus, a peer reviewed report about conservation aquaculture of white sturgeon in the Kootenai River,

and annual progresss reports. IDFG and KTOI have an information booth and display of live juvenile white sturgeon at the county fair. KTOI is preparing an informational pamphlet about conservation aquaculture and sturgeon recovery for the general public. Tours are frequently given at the Kootenai Tribal Hatchery to local school groups and interested citizens. BC MELP plans to add a white sturgeon display at Kootenay Trout Hatchery in British Columbia.